



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

Subject:	CONSTRUCTION MEMORANDUM NO. 95-53
Articles 407.09 and 420.12	
California Type Profilograph	Effective: January 3, 1995
	Expires: Indefinite

This Memorandum supersedes Construction Memorandum No. 92-53, dated January 15, 1992.

NATURE AND PURPOSE OF TEST

Profilograph testing of portland cement concrete or full-depth bituminous concrete mainline pavement is required on projects with a posted speed greater than 70 km/h (40 MPH) and a net length of over 1600 m (one mile). Such testing is performed to determine (1) the daily profile index for each required profile, (2) the average job profile index, (3) the location and profile indexes of all 160 m (0.1 mile) sections which exceed specification tolerances, and (4) the location of all individual high points having a deviation in excess of 8 mm (0.3 inch).

The Specifications require (1) that the Contractor use methods and equipment which consistently produce a finished surface having daily profile indexes of 160 mm per km (10 inches per mile) or less, (2) that all individual high points in excess of 8 mm (0.3 inch) (bumps) must be reduced by corrective grinding and (3) that after individual high points have been reduced, payment to or corrective action by the Contractor shall be made in accordance with the Schedules shown in the Standard Specifications for the type of pavement placed.

When the average profile index of the mainline pavement for the entire project is less than a set value, the unit bid price will be increased by the percentages shown. Increases in the bid price will only be applied if the profile of every 160 m (0.1 mile) section does not exceed 160 mm/km (10 inches/mile). The adjustment is made to the entire mainline pavement quantity. When the profile for a 160 m (0.1 mile) section exceeds 160 mm/km (10 inches/mile) but does not exceed 235 mm/km (15 inches/mile), the unit bid price for that section will be reduced by the percentages shown. The adjustment will be made to each appropriate section.

Except for bump corrections, the Contractor will not be allowed to make corrective grinding to increase the percent of pay when the final profile index is 235 mm/km (15 inches per mile) or less.

Segments with a profile index of greater than 235 mm/km (15 inches per mile), after bump correction, shall be ground until the measured profile index is 235 mm/km (15 inches per mile) or less, or at the contractor's option and expense be removed and replaced. If the Contractor elects to perform corrective grinding the maximum amount of pay for that segment of pavement will be 90% of the contract unit price. If the

Contractor elects to remove and replace that segment, payment will be made at the percent of contract unit price that corresponds to the replaced segment's final profile index.

On those 160 m (0.1 mile) pavement sections where corrections are necessary, second profilograph runs will be performed to verify that corrections have produced a profile index 235 mm/km (15 inches per mile) or less. If the initial profile index is less than 235 mm/km (15 inches per mile), only the areas representing 8 mm (0.3 inch) deviations will be reprofiled for correction verification.

The daily profile index computed for the purposes of determining the performance of paving methods and equipment used by the Contractor shall be determined by averaging the daily profile index of each required profile line as outlined in Test Method No. California 526-D and the Standard Specifications.

Interpretation of profiles is thoroughly discussed in Test Method No. California 526-D. Included are definitions of what length and width of scallop is necessary to be considered in the count. In determining the profile index, it is important to follow closely the instructions in the test method. Failure to do this can result in an inequity either to the Contractor or the State.

The following items of information should be included on the profilograms for project documentation.

1. Reference "pip" marks and identifying stationing should be made as follows:
 - a. Beginning and ending of each day's profile.
 - b. Every station mark on continuously reinforced pavement or every contraction joint on standard pavement. (Label station of contraction joint minimum of 70 m (225 feet).
 - c. Every construction joint.
2. Identifying marks showing the placement of the blanking band for each 160 m (0.1 mile) evaluated.
3. The profile index for each 160 m (0.1 mile) section.
4. Calculation of day's profile index for each line run. Label the location of each profile line at end of each day's profile.
5. The strike-off line for each "must grind" or bump in excess of 8 mm (0.3 inch) in 8 m (25 feet) or less.
6. When evaluating 160 m (0.1 mile) sections of profilograms containing structures and approach pavements, the 160 m (0.1 mile) section count is determined as if the structures and approach pavement plus 15 m (50 feet) on either side were not there.

OBTAINING JOB PROFILES

The initial profilogram should be run the working day following placement of the pavement. Immediately after obtaining the profiles, they should be evaluated and the results given to the Resident or whoever has been delegated the responsibility for pavement inspection. The information is necessary for determining compliance with specifications and the paving Contractor is also eager to be informed of the results as soon as possible.

On the strip chart, the various profile lines should be oriented one above the other in order that the stationing is coincidental with each line. By doing this, one can readily see whether pavement bumps and depressions extend across the full paving width. Counts can be readily compared to adjacent profiles and identification and filing profilograms is simplified.

Recommended practice is to profilograph in the direction of paving. However, repeated tests proved that running the profilograph in opposite directions along the same line resulted in no significant difference in profile index count. Therefore, in practice, it is permissible to run the profilograph in the opposite direction when safety or other conditions so dictate. For example, on a widening project, it may be safer and thus preferable to profilograph in a direction opposite to the flow of adjacent traffic irrespective of the direction of paving. The profilograph unit should never be operated in a reverse direction because of difficulties in steering and crabbing of the profile wheel.

CORRECTION WORK

With respect to the procedure for the correction of excessive pavement roughness, the Engineer must first identify two items on the pavement -- the individual high points exceeding 8 mm (0.3 inch), and the 160 m (0.1 mile) sections exceeding 235 mm/km (15 inches per mile). Individual bumps exceeding 8 mm (0.3 inch) can best be identified by paint marks measured from known reference points marked on the profilogram. It can be seen that the person running the profilograph can make this much simpler if they mark frequent reference points on the profile from stationing or other marks placed on or near the edge of the pavement.

During corrective work, the Engineer must ascertain that each individual high point in excess of 8 mm (0.3 inch) is specifically cut. The Contractor should be permitted to refer frequently to the profilograms during corrective work, although to safeguard these important job records, s/he is not given custody. A copy of the profilograms may be given to the Contractor.

Recorded bumps are relative to the plane of the supporting wheels of the profilograph. If there should be a low area in an otherwise flat pavement, the profile would indicate a high point as the front supporting wheels dropped down into the low; then a low point as the front and rear supporting wheels spanned the low and the recording wheel dropped into it; and finally, a high as the rear supporting wheels passed through the low. If during bump cutting, either of these "high" points is selected for cutting, and the bump cutter is directed into the bump from the level plane, the operation will probably not be effective. If, however, the bump cutter is started into the bump from the low

area, it will tend to cut its way out. This will reduce the abruptness of the low area, thus decreasing the count and improving rideability.

Satisfactory completion of grinding work must be checked by reprofiling the ground areas. It is only necessary to reprofile those areas in the vicinity of grinding to determine that the "must grinds" have been adequately corrected, and that there has been adequate grinding to reduce the profile index in the 160 m (0.1 mile) sections to 235 mm/km (15 inches per mile) or less. The short sections thus profiled can be overlaid on the original profilograms for this determination. Reprofiling of an entire 160 m (0.1 mile) section will only be required when the Contractor grinds a 160 m (0.1 mile) section with a profile index of over 235 mm/km (15 inches per mile) (after 8 mm (0.3 inch) bumps have been ground) to reduce the profile index to 235 mm/km (15 inches per mile) or less. The reason for limiting these areas of reprofiling is that surface profiles may change with time and the possibility exists that within a 160 m (0.1 mile) section, an increase in roughness could occur outside the areas corrected by grinding. It would not be appropriate to require the Contractor to correct roughness that is beyond his/her control.

Where corrective grinding has been unavoidably deferred over the winter period, it has been found that additional roughness, higher counts for 160 m (0.1 mile) sections and/or greater deviations for individual high points exceeding 8 mm (0.3 inch) can occur. If this situation occurs, all 160 m (0.1 mile) sections of pavement exceeding a profile index of 235 mm/km (15 inches per mile) after individual high points exceeding 8 mm (0.3 inches) are removed, must be reprofiled and corrective grinding required to comply with the specifications.

Grinding detracts from the appearance of completed pavement. Care should be exercised to avoid correction of minor irregularities where grinding will remove only a thin layer of surface material and effect little real improvement in profile index or uniform surface appearance, bounded laterally by lane lines or edges of pavement.

All areas of portland cement concrete pavement that are ground shall receive a protective coat at the Contractor's expense in accordance with Article 420.21.

A handwritten signature in black ink, appearing to read "R. L. Hinton". The signature is fluid and cursive, with a large initial "R" and "H".

Robert L. Hinton, P.E.
Engineer of Construction